

Design of a Lab-Scale RORO Stern Ramp Test Facility

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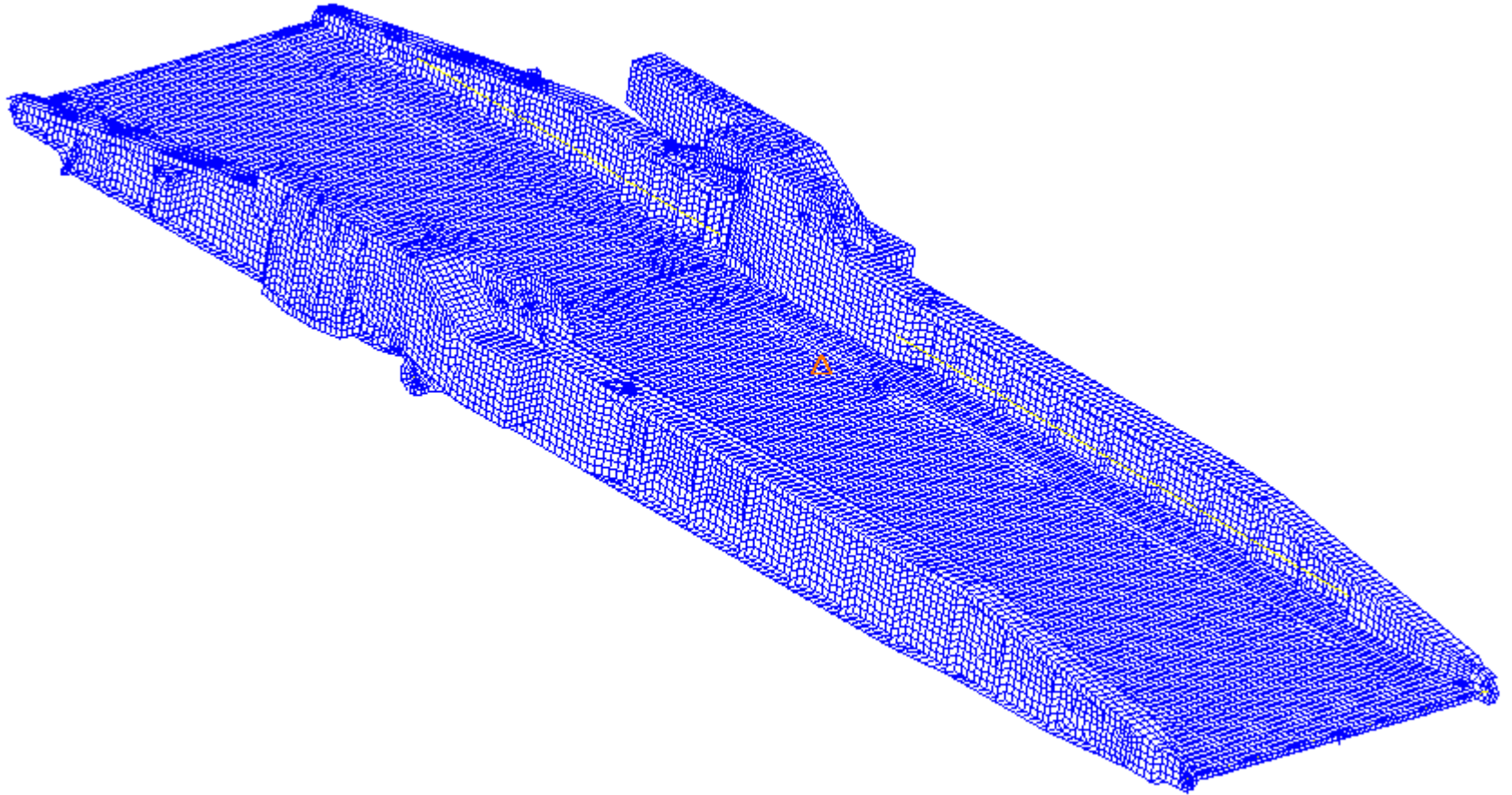
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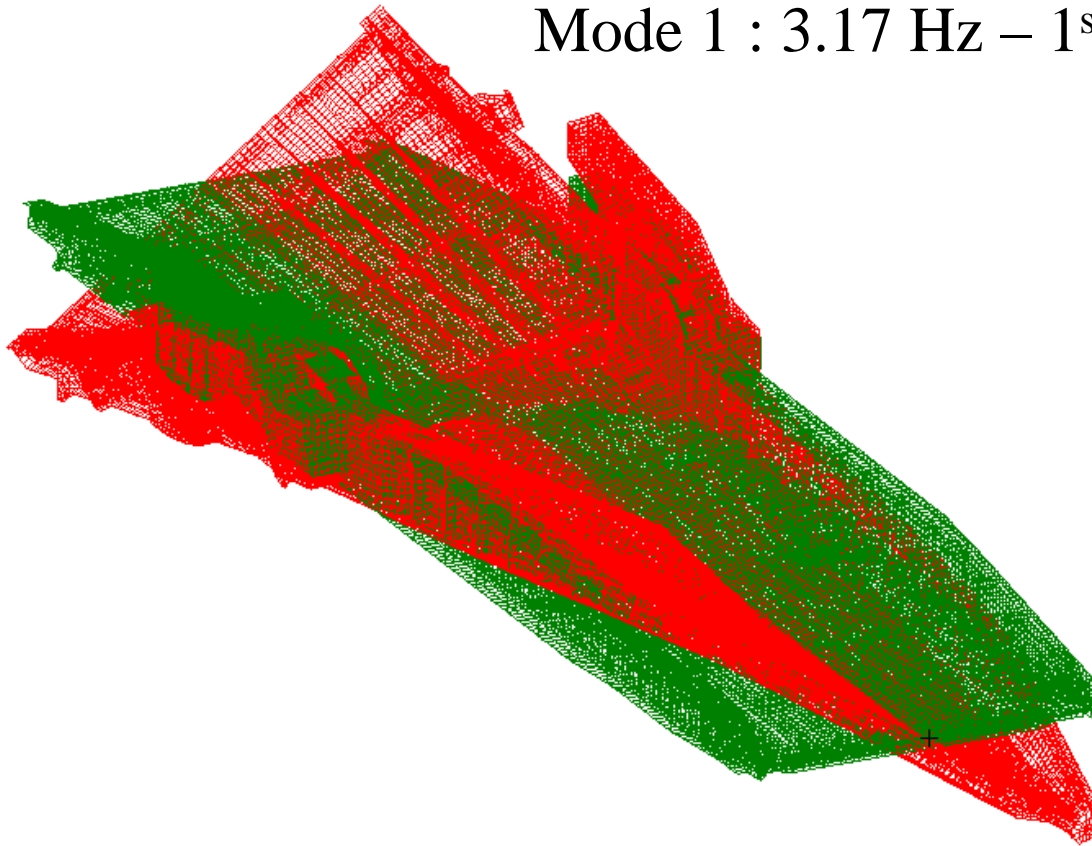


Cape T Stern Ramp : Free-Free Modes

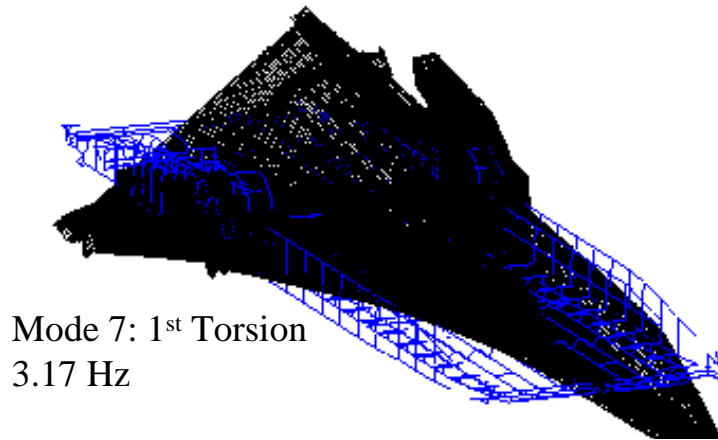


Cape T Stern Ramp : Free-Free Modes

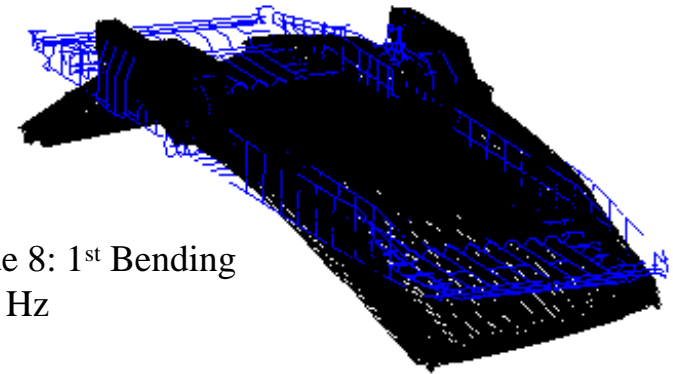
Mode 1 : 3.17 Hz – 1st Torsion



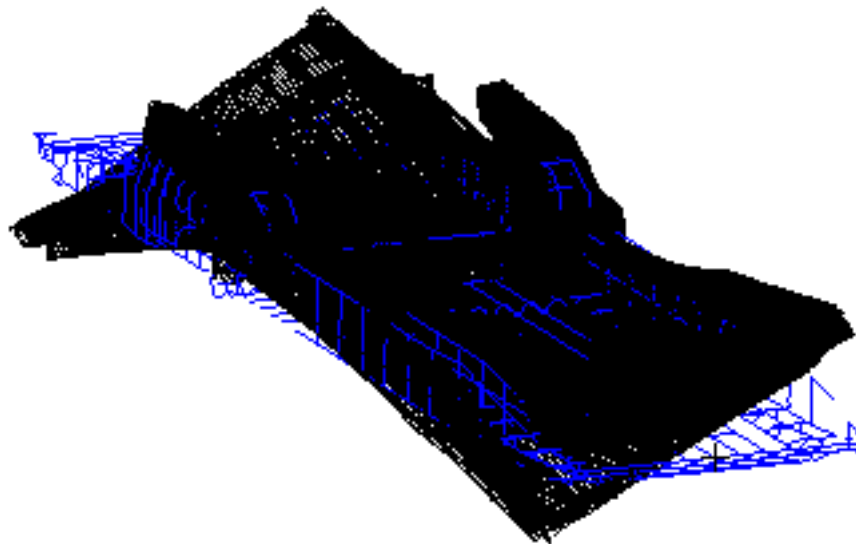
Cape T Stern Ramp : Free-Free Modes



Mode 7: 1st Torsion
3.17 Hz

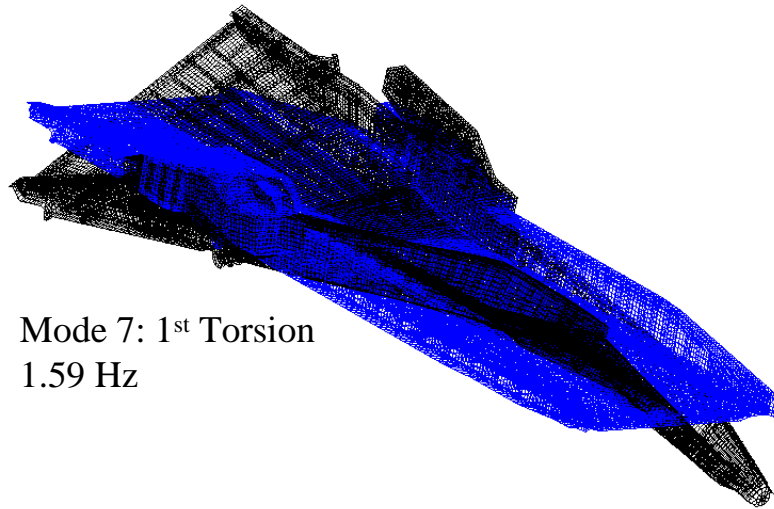


Mode 8: 1st Bending
6.95 Hz

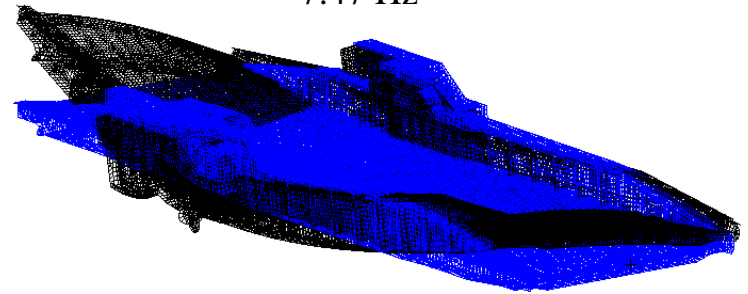


Mode 9: 2nd Torsion
8.53 Hz

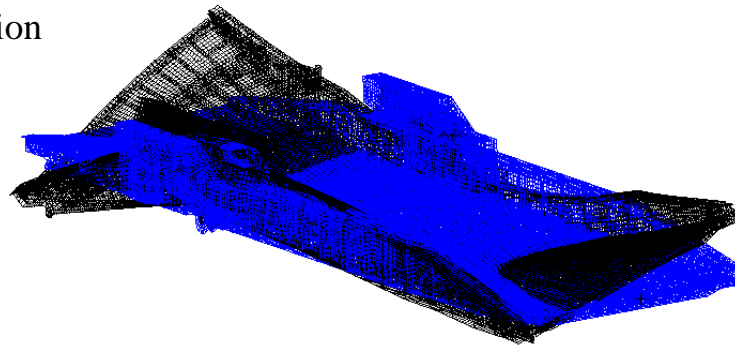
Cape T Stern Ramp : Free-Free Modes No Tank



Mode 7: 1st Torsion
1.59 Hz



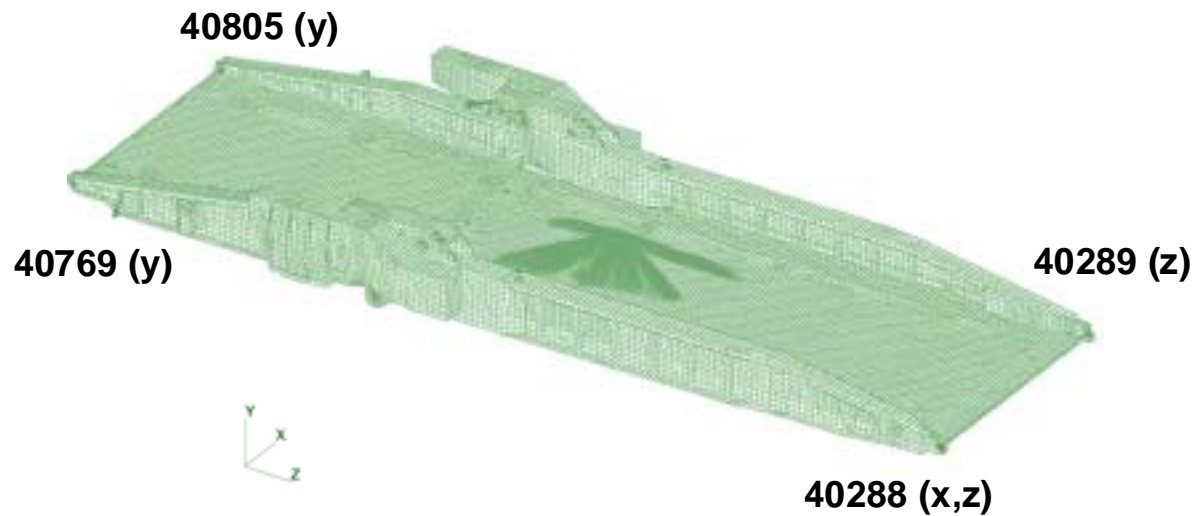
Mode 8: 1st Bending
7.47 Hz



Mode 9: 2nd Torsion
9.72 Hz

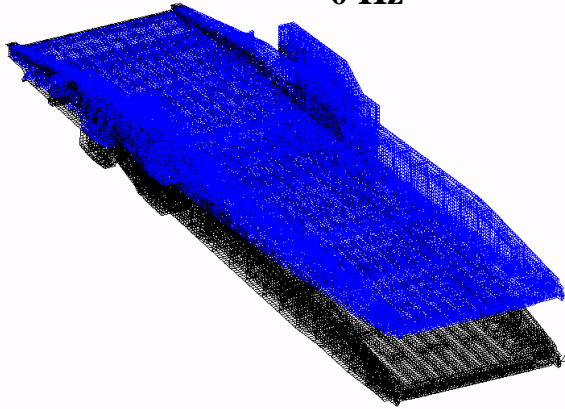
Cape T Stern Ramp : Pinned Modes

Boundary conditions at support points

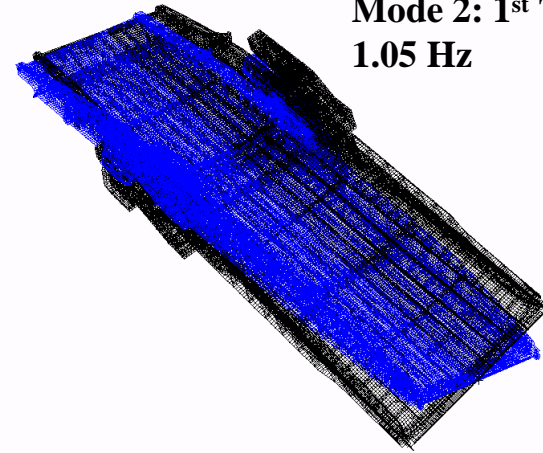


Cape T Stern Ramp : Pinned Modes

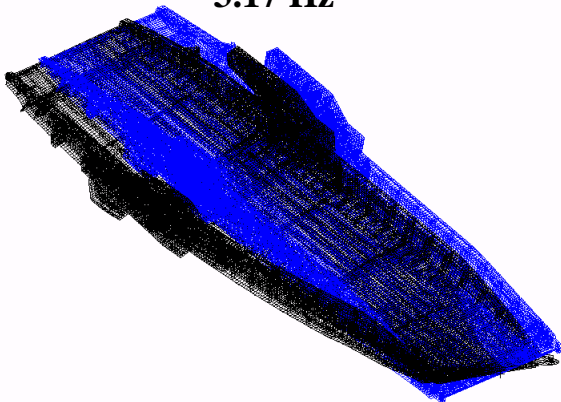
Mode 1: Rigid-Body Pitch
0 Hz



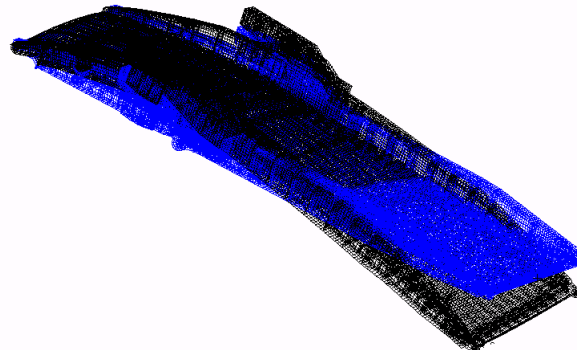
Mode 2: 1st Torsion
1.05 Hz



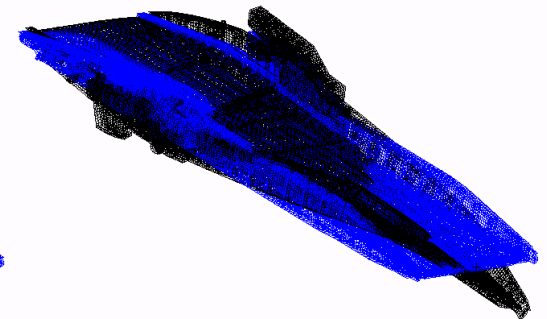
Mode 3: Yaw + 2nd Torsion
3.17 Hz



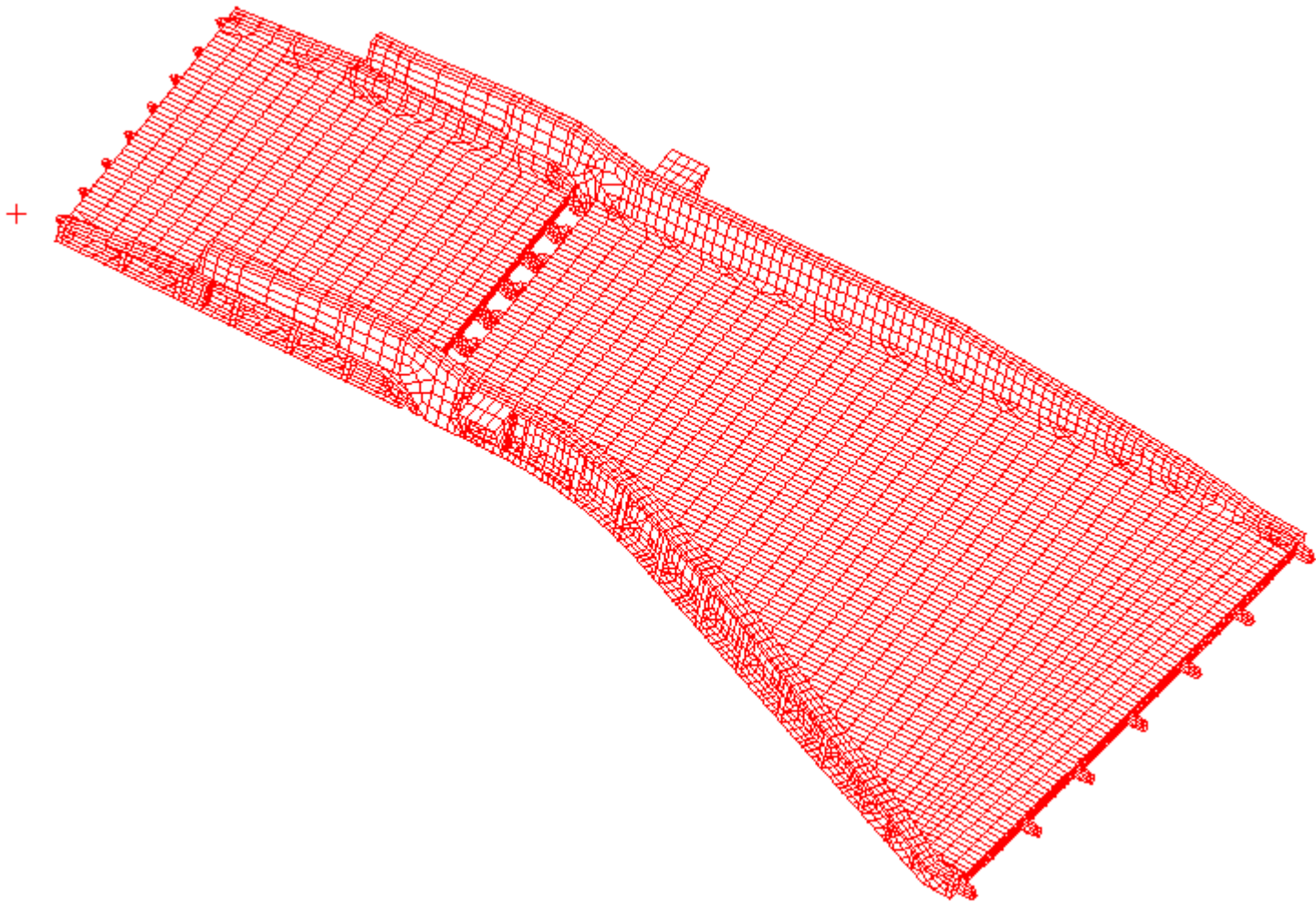
Mode 4: 1st Bending
4.35 Hz



Mode 5: 2nd Torsion
6.71 Hz



Cape H Stern Ramp : Free-Free Modes

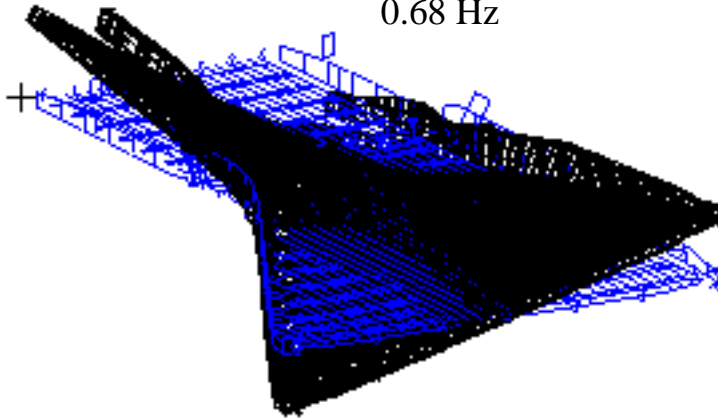


Cape H Stern Ramp : Free-Free Modes

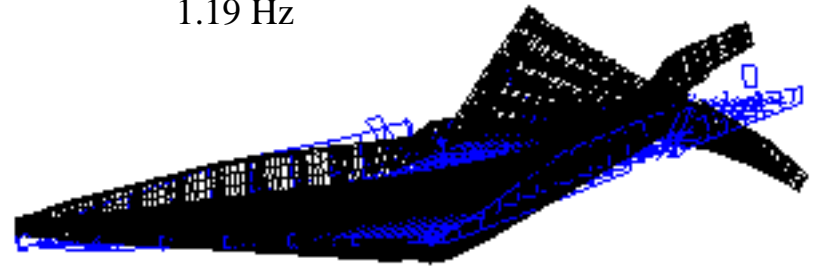
Mode 7: Hinge Rigid-Body
0 Hz



Mode 8: 1st Torsion
0.68 Hz

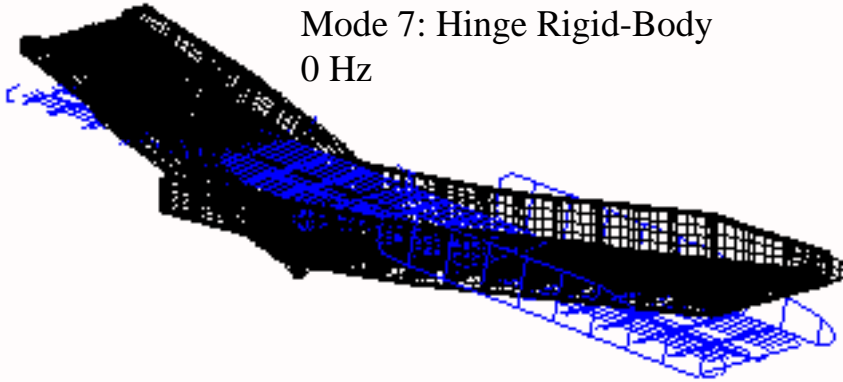


Mode 9: 2nd Torsion
1.19 Hz

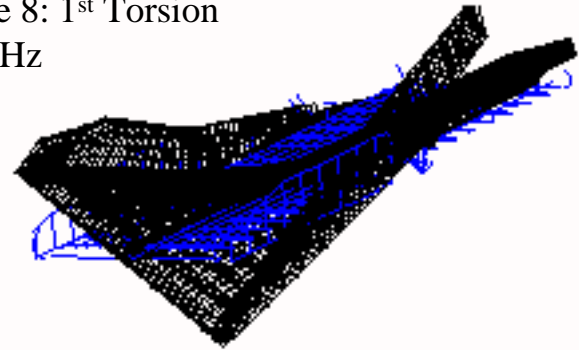


LMSR Stern Ramp : Free-Free Modes (NASTRAN)

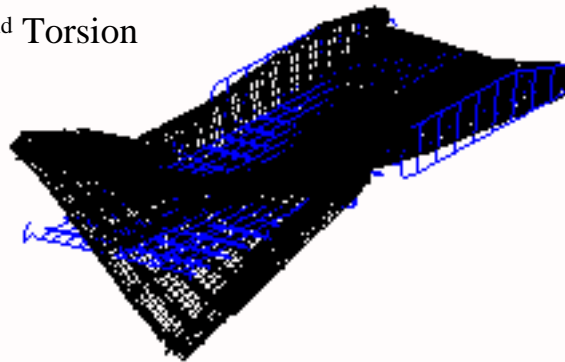
Mode 7: Hinge Rigid-Body
0 Hz



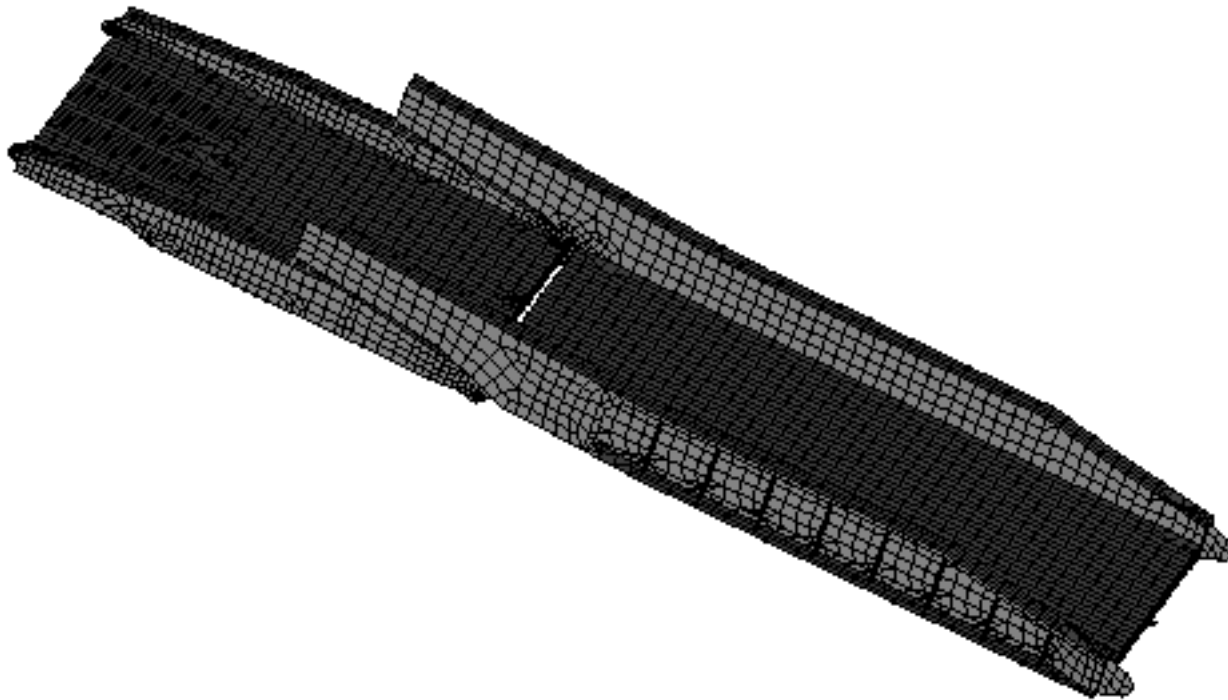
Mode 8: 1st Torsion
0.90 Hz



Mode 9: 2nd Torsion
3.86 Hz

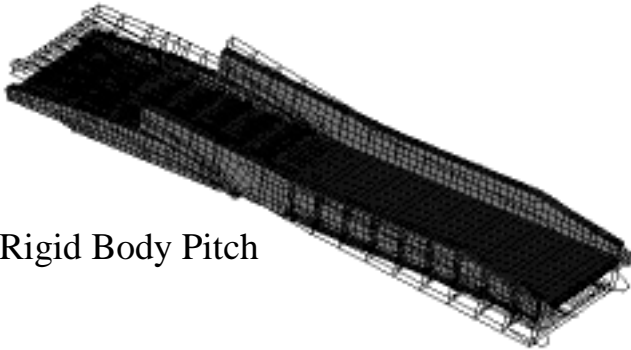


LMSR Stern Ramp : Free-Free Modes (ANSYS)

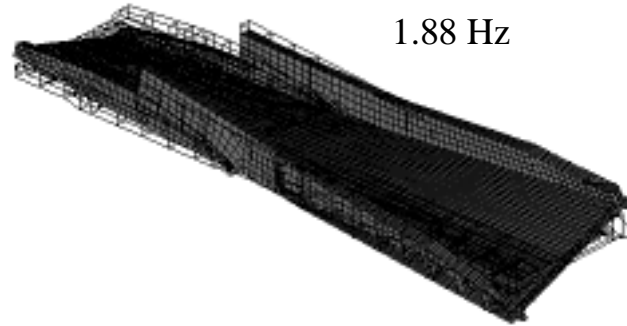


LMSR Stern Ramp : Free-Free Modes (ANSYS)

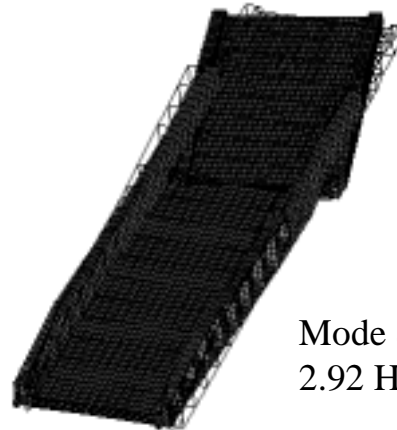
Mode 6: Rigid Body Pitch
0.18 Hz



Mode 7: 1st Torsion
1.88 Hz



Mode 8: 1st In-Plane Bending
2.92 Hz



Scale Ramp Design

Cape T Mode Frequencies in Hz

Mode No.	Mode Shape	Free-Free w/ Tank	Free-Free w/o Tank	Pinned w/ Tank
1	1 st Torsion	3.17	1.59	1.05
2	1 st Bending	6.95	7.47	4.35*
3	2 nd Torsion	8.53	9.72	6.71

* Yaw + Torsion mode at 3.17 Hz

First three modes of scale ramp should have same mode shapes: 1st Torsion, 1st Bending, 2nd Torsion